# Unveiling the low efficiency of tin perovskite solar cells with metal oxide/tin perovskite interface and usefulness in thermoelectric applications

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Halide perovskites with superb optoelectronic properties and ultralow thermal conductivity have found potentially inexpensive coating process. In general, tin halide perovskite show short circuit behavior when coated on inorganic metal oxide in normal architecture solar cell, and reason behind this unusual behavior is not clear.

Tin halide perovskite, $CsSnI_3$ are developed as a potential thermoelectric harvesting medium owing to high electrical conductivity and decent Seebeck coefficient. Their electronic properties are governed by corner sharing flexible $SnI_6$ octahedra. Commonly observed trade-off among thermoelectric parameters ($ZT=\sigma S^2/k$; ZT=figure of merit; σ=electrical conductivity, S=Seebeck coefficients and k is thermal conductivity) can be overrule in a perovskite nanocrystal grown over metal oxide in a nanocomposite. Here in, solution processed $CsSnI_3$ crystal growth are observed in presence of various inorganic metal oxides scaffolds $Al_2O_3$, NiOx, $SnO_2$, $TiO_2$, ZnO, and $ZrO_2$.

One step nanocrystal growth of $CsSnI_3$ film is followed in assistance with toluene as an antisolvent. The resulting equimolar mixture of ($CsI+SnI_2$) precursor solution was spin coated over the inorganic porous layer followed with baking at moderate low temperature 130 ℃/20 min to grow perovskite crystal in various nanocomposite. The behavior of $CsSnI_3$ in various nanocomposite structure is studied in lieu of defects states available in valence band of underneath metal oxide layer. A direct correlation is observed with defect states and measured electronic properties. The details of this study relating to thermoelectric performance evaluation would be discussed in detail in the conference.